Research on the Design of Medical Escort Furniture from the Perspective of Epidemic Normalization: A Case Study of Multi-Purpose Escort Bed Design

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Abstract. This paper discusses the situation of the medical escort furniture under the new coronavirus epidemic normalize, the design means to improve the situation of the medical escort furniture, put forward from the actual situation of the users, then from the physiological needs, psychological needs and so on, with safety, humanity, space-saving design concept, the medical escort furniture suitable for most hospital environment design comfort, so that the various functions in the ward coordinate with each other, designed patient-oriented, auxiliary medical escort furniture.

Keywords: Epidemic Normalization; Medical Escort; Escort Furniture; Humanized Design.

1. Medical Escort Furniture Overview

The purpose of ward design is to reduce patients' pain and revulsion and regulate patients' mental state. Patients have psychological needs to be respected, recognized, self-actualized, and the ward should also meet basic living conditions such as physical needs, rehabilitation needs, and safety needs [1]. There is a growing awareness among doctors that patients' recovery depends not only on the outcome of treatment, but also on the support and atmosphere of treatment surrounding their families. Escort is the daily care and companionship of a patient by family and carers. Specifically, the care of the patient in life, food and drink, some psychological care, providing health care staff with the latest trends in the patient's illness, and helping the patient complete rehabilitation.

Under the normalized control of the epidemic, the National Health Commission and provincial and municipal health commissions have issued relevant documents. If the Sichuan health commission requires the ward to be under lockdown, the hospital will implement a "one-person, one-person escort" system, allowing only one family member to accompany the admitted patient if the nucleic acid test results are negative. At the practical level, it goes without saying that the system of only one family member accompanying a patient is a fundamental relief to hospitals and the national epidemic prevention and control pressure. It also avoids, to varying degrees, the problem of family gathering in inpatient wards and the potential for cross-infection caused by large numbers of people coming in and out frequently. This kind of escort system is put forward in response to the need to normalize epidemic prevention and control and to meet the needs of epidemic prevention and control. This makes the needs of chaperones even more unattended and requires a certain level of care from the appropriate facilities.

Hospital chaperone furniture refers to the furniture such as sitting and sleeping equipment used for the rest of the family of a hospitalized patient. The rational design of hospital chaperone furniture can ensure that the chaperone's family members receive basic rest, meet their basic physiological needs, and finally become more active in caring for the patient. Keeping patients and families together can speed up the recovery and treatment process and improve recovery outcomes. Wards should be patient-centered, but they should also provide reasonable spatial planning and layout for health care workers, visitors and chaperones to meet the needs of all parties. Furniture in a medical setting is particularly important to meet the basic needs of the patient's accompanying family in order to maximize the therapeutic effect. Medical furniture is more heat resistant and corrosion resistant than ordinary furniture, and it needs to be durable and structurally stronger. Medical furniture is not as casual as home furnishings, to conform to the style of hospitals, generally have warm colors, give

patients a warm feeling [4]; The cabinet structure of medical furniture should be harmonious and fastened, convenient to use and easy to remove and install must be required.

2. Field Research on Medical Escort Furniture

2.1 Medical Escort Furniture Market Research

For a long time, the development of medical furniture in our country is relatively slow, medical space environment gives a cold, business sense, rare warm feeling. While medical furniture has received attention in recent years due to the normalization of the pandemic, there is a pervasive sense of mechanics in medical furniture, a lack of humanity and a lower degree of medical classification in medical supply planning. At present, China has a medical furniture market, which shows the characteristics of strong overall demand, insufficient product design ability and weak market competitiveness, as follows: product design homogenization is serious, the degree of differentiation is low; At the marketing level, the level of medical furniture design and exhibition is not high, the ability of publicity is not strong; As far as the overall furniture environment is concerned, some hospitals and businesses place less emphasis on medical furniture [5].

Table 1. Survey of hospital escort furniture (Picture: Author Self-Portrait)

Name	Product Photos		Pros and cons
	Form of Folding	Form of Spread out	
Simple escort bed			Lack of comfort, easy to move, low price, easy to manage, need to cooperate with other seat use, for most of the domestic hospitals to use the accompanying furniture.
Folding escort chair			Compared with the simple cots, the comfort level is further improved, the occupation area is moderate, easy to move, easy to manage, for a small number of domestic hospitals to use the accompanying furniture.
Escorting the sofa bed			High comfort, occupy a large area, high price, inconvenient to move, except for VIP wards, no hospitals in China temporarily used.
Shared companion bed cabinet			To save medical space, comfort is general, easy to use, need to use in the ward with the seat.

After the experience of hospital chaperone, the author conducted research on the hospital chaperone furniture market, classified the hospital chaperone furniture and analyzed its advantages and disadvantages, the research result is shown in table 1.

In short, the design of medical escort furniture is still in its infancy and has great market potential. In the future, medical escort furniture will be further developed in humanistic design, environmental protection and energy conservation. Medical escort furniture will also be infused with greater design and research power as the market becomes more focused on patients and chaperones. Medical furniture should not only meet people's daily needs, but also take into account the need for healthcare

workers to interact with patients as they work. As far as medical furniture industry is concerned, functional furniture with reasonable layout can solve the problem of unreasonable medical environment. Through the humanized design of medical escort furniture, patient satisfaction and communication efficiency between medical staff and escorts can be improved. In addition to realizing the basic function of medical escort furniture, it also slows the pain of patients and chaperones during daily hospitalization, improves the efficiency of medical staff, reduces the intensity of work, etc., and even improves the trust between doctors and patients, which in turn increases market competitiveness and creates a better medical experience, which is counterproductive to the improvement of medical furniture industry standards.

2.2 Research on the Use of Medical Escort Furniture

Sun Yat-sen Memorial Hospital in Sun Yat-sen University, for example, usually has a stool in its ward for chaperones to rest on, and in the evening, folding beds are distributed uniformly for use as bedding at night. The author thinks that the process of returning the cot is cumbersome and needs to leave the patient's side for a short time, which may upset the patient. At noon, the rollaway beds cannot be rented for rest, which is disadvantageous to the long hours of escort work.

Of the 56 patients in Sun Yat-sen Memorial Hospital's orthopaedic inpatient department, 100 percent were accompanied by family members. Of those, 16 patients who were unable to take full care of themselves after surgery were accompanied by family members all day, the study found. Because of the speciality of the department, there are patients who can't take care of themselves after operation at different times. Based on the interviews with the patients' families, it is concluded that: 1. The family can meet the needs of overnight care. 2. Unified distribution and better management; 3. Lack of comfort 4 The escort bed is heavier and takes more effort to move and fold. The evaluation of the common seat is as follows: 1. It can meet the needs of people and patients. 2 Unable to stretch properly at rest; 3. Incapacity for visits and escorts.

3. Needs Analysis

Compared with other furniture, medical furniture is special, targeting four different groups of users: doctors, patients (including chaperones), medical personnel, etc. In the future, medical escort furniture will be further developed in humanistic design, environmental protection and energy conservation. To understand what users really want, they need to come from different departments, from different functional areas to start physically, mentally and behaviorally [5].

3.1 Patient Demand

The high demand of patients for escort is related to Chinese traditional culture, patients' psychological needs, nursing mode, etc. In the traditional biomedical care model, the main restriction on companionship management is to maintain normal medical order and prevent nosocomial infections. Chinese tradition uses the word "kinship" to describe the relationship. In modern society, more and more people want to have a family member or friend to accompany them. When a patient is hospitalized, as their role changes, they develop specific psychological needs that manifest themselves in increased dependency, reduced independence, anxiety, fear, and a desire to be cared for by their loved ones and those around them [6]. Table 1 shows that patients younger than 20 and older than 50 years of age have a higher need for care than patients aged 20 to 50 years, possibly due to the fact that patients in this age group are less independent and more dependent, and have difficulty adjusting to changing roles after hospitalization.

According to the above data, in the elimination of pain, environmental comfort, security and so on, the elimination of pain and environmental comfort is the basic physiological needs of patients, but also the most urgent. At the physiological level, the physiological and safety needs of patients should be met as much as possible. Hospitals are unfamiliar environments for patients, and when patients believe their health or even their lives are at risk from the disease, safety has to be a top priority. They

believe patients need bedside care that hospitals can't fully provide and that loved ones feel safe around [8]. The physiological needs of hospitalized patients are mainly to eat, drink and relieve pain, as well as to solve the problems of rest and sleep, posture and movement. Psychologically, hospitalized patients are more likely than the general population to experience depression, depression and other pessimism, but the psychology of patients is a desire to recover and return to normal life as soon as possible. So, when ward and ward furniture design, want to work hard in color, material, modelling as far as possible the positive effect of psychological suggestion. The rational use of color in medical settings helps to create a special atmosphere to regulate mood, to ensure a patient's peace of mind and to alleviate illness.

Table 2. Survey of Patient Care Needs by Age (data source [7])

Need for escort					
Age	Total number of cases	Cases	Percentage(%)	X^2	P values
< 20	105	90	85.7	4.74△	< 0.05
20−50	102	75	73.5		
> 50	150	127	84.7	4.75*	< 0.05

Note: △ is the comparison between group < 20 years old and group 20−50, and * is the comparison between group > 50 years old and group 20−50.

3.2 Escort Requirements

In the construction of hospital wards, the needs of patients are often put first, while the needs of another important group of people are often neglected, with little regard for their needs, which is to accompany family members and visitors. With the improvement of social and economic development and medical technology, people put forward higher demands on nursing work, and as one of the most frequent contact groups of nursing staff, the psychological status of nursing family directly influences the quality of medical staff and doctor-patient communication. The patients' families have psychological stress, worry about the patients' illness and hospitalization, and care about the patients' living and living life, which will help the patients to recover their physical health as quickly as possible. The day ward is often visited by friends and family who stay for a relatively short period of time, usually to communicate with the patient in the room. Due to space constraints in the wards, each bed has one seat and most visitors, accompanying family members, either stand by the bed or take a nap in a communal seat in the corridor, standing outside the ward for communication [9].

3.3 Healthcare Needs

Paramedics are working long hours and under pressure, while the responsibility of being a doctor is once again stressing them out. In recent years, there have been a number of medical incidents, which have brought great harm to medical personnel both physically and psychologically, and made many medical personnel more demanding of their safety at work. It is the responsibility of healthcare workers to help patients regain their health with the help of medical technology. The work space in the wards is dominated by the perimeter of the beds and there is a need for adequate space for medical devices to operate normally. They want to communicate with patients, keep track of their condition, use the right protocols to deal with them, help them overcome their fears and be successful in treatment. Nurses should be scheduled to go to the ward for care, observe and inquire about changes in the patient's condition, and promptly instruct the patient to take medication, check the room, administer fluids, rest, etc. Due to the large number of patients and the shortage of medical personnel, the imbalance in human resources allocation, the heavy workload of medical personnel, the possible accidents, and the lack of understanding of the patients' families, increase their work pressure, make

the body prone to fatigue, resulting in occupational fatigue, which adversely affects the quality of life and medical care.

4. Principles of Medical Escort Furniture Design

4.1 Safety Principles

Due to the cramped space in the wards, excessive family care can lead to crowded environments and infection of the virus, making the spread of germs more difficult to control. Therefore, facilities and equipment must be provided for the care of health care workers, and accompanying furniture is an essential part of this work. Medical space is a kind of special public space, has the specialized characteristic, has the very high requirement to the cleanliness and the safety, in order to meet this special use environment, the escort furniture design should conform to the medical furniture easy to clean, the safety is high, the fastness index is high, these requirements may meet the safety principal request from the selection material.

In addition to material selection safety, poor furniture design and unstable construction can lead to irreversible accidents. There are statistics in different areas that show the number of casualties caused by overturned furniture, 6 deaths and 1,832 injuries caused by overturned drawer lockers and 4 deaths and 2,321 injuries caused by overturned television cabinets [10]. The shocking data shows the importance of the safety of medical furniture. From the point of view of hospital, choose safe medical furniture should pay attention to: 1 stability is high: the bottom is stable, affixed ground weight is big; 2. High endurance: strong and durable without deformation by gravity; 3. Solid structure: the binding part is tight, leaving no hidden safety hazard; 4 Low hazard factors: Avoid accidents caused by sharp angles and material fractures.

4.2 Principle of Humanity

Medical escort furniture requires not only beauty, but also comfort and ease of use. Medical furniture design places particular emphasis on integrating ergonomics. Furniture design scale, form, color and its arrangement must be consistent with the body physiology, psychological scale and body parts of the law of activities, so as to achieve safety, practicality, convenience, comfort, aesthetic efficacy. The comfort that medical escort furniture asks for, in fact, is the affection that the person's physiology body gets stretch, psychology is comfortable, heart is relaxed and produced to the person's survival function beneficial. Therefore, their characteristics should be taken into account in the design, and according to their characteristics of reasonable mix, in order to better provide quality and efficient services to the majority of patients. When people are in a comfortable state, they experience physical sensations such as a slower heartbeat and pulse, smooth blood flow and relaxed muscles, making them pleasant and beneficial to their physical and mental health. Therefore, medical furniture should be comfortable. The comfort involved in the design of medical furniture includes the following aspects: human behavior stretches appropriately; People's perception, touch comfort and furniture quality have no adverse impact on the human body. Therefore, consideration should be given to the combination of function and comfort, so as to adapt it to the physical and mental characteristics of the user and meet the needs of people at different levels, in order to improve the comfort of medical escort furniture and promote patient rehabilitation. Medical escort furniture should be easy to use, flexible in presentation, reasonable in placement, and ergonomic [11]. After meeting the above conditions, chaperones can feel comfortable and more human.

4.3 Principles of Space-economy

Most hospitals have implemented "intensive care," where families of patients unable to care for themselves are given priority in choosing accompanying furniture to strengthen hospital capacity and the number of people available to care for them. This leads to the need to design companion furniture in a way that minimizes medical space, has foldable, portable, and storage features, saves medical space, and maximizes user comfort and other requirements. During the day, medical staff are required

to perform frequent observation and measurement of a patient's signs and care, and at night, they are required to take measurements every two hours. So, in order to make it easier for staff to operate, escort beds should fold and move flexibly to avoid crowding the wards by taking up space.

5. Cases of Medical Escort Furniture Design: A Case Study of Multi-purpose Escort Bed Design

5.1 Design Ideas

In our research and practice, we feel that hospitals are not only the place to treat patients with physical ailments, but also the healing space to rehabilitate patients' bodies and soothe their minds. Faced with the idea of hospital construction with doctor-patient as the center, we need to develop an effective design concept to practice it. To this end, we have come up with the concept of 3H as Home, Hotel and Hospital to create medical furniture with the warmth of home, hotel comfort and hospital features. "In addition to the above design principles, we believe that medical escort furniture needs to meet the basic requirements of pandemic normalisation," he said. "This strategy has led us to examine the medical escort furniture on the market, enabling the medical environment to be integrated with it to create designs that are conducive to spatial integration." In order to better meet different needs, we have finalized foldable solutions as a core part of the overall program design and based on this research work. According to the design concept of "people-oriented and life-friendly", several folding schemes are considered to design. This includes unfolding and pulling out to fit into the medical environment in order to make the escort feel comfortable in the principle of space conservation.



Figure 1. Concept map of the "3H" design concept (Picture: Author Self-Portrait)

The 3H design concept is designed to make the environment feel "at home" to patients. "The concept of modern medicine has expanded from treatment to prevention, from physiology to psychology" [12]. Many researchers believe that patients should be seen not just as patients, but as customers and consumers of hospitals. In fact, some hospitals have been designed with the inclusion of the 3H design concept, whose primary function is to house the patient's family, bring economic benefits to the hospital, and provide a place of rehabilitation for milder patients [13].

5.2 Design Options

When thinking about the design scheme, we think about the space design under the hospital bed, and also about the space saving on the ground. Finally, we think that the most valuable and humanistic principle is to use the wall space for the design. Because the wards are crowded during the day, escort beds should be designed to take fully into account the passing traffic of all types of people or the use of medical devices to save space. Escort beds are designed to be foldable to hide or reduce volume attached to walls, collected during the day and released for use at night. Escort beds are designed to be easy to operate, cost effective, and styled in a way that aligns with the overall environment in the ward.



Figure 2. Ward Day Concept (Picture: Author Self-Portrait)

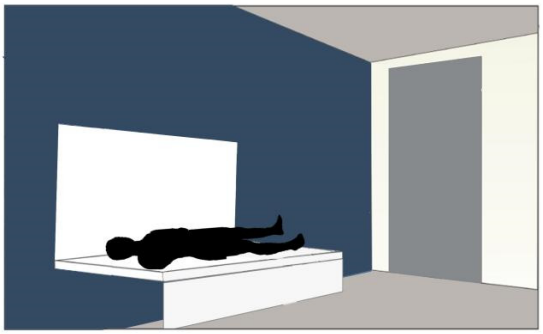


Figure 3. Ward night use concept (Picture: Author Self-Portrait)

It is a multi-purpose medical escort bed designed for the families of patients, and the overall colour scheme is made up of metal and white panels to match the colour of the ward and minimise the sense of volume in the room. It looks like a plain, long, flat storage cabinet, but it contains a whole lot: when the door is pulled down, the two boards form a 90-degree right angle to support the user, making it an 1800mm x 450mm easy-access sofa for three or four people on which escorts and guests can sit for visits and conversations. When the chaperone needs a break, pull the flat planks outwards and the hardware slide locks in automatically, unfurling it into a single bed of 1800mm x 900mm, allowing the chaperone to spend several nights or even weeks in comfort. Below, there are three drawers, one short and one long, for storage, which can accommodate both chaperones' clothing and rest beds, saving some medical space while making storage easier. There are also two plugs on the side cabinet for use, two and three inserts and even a USB jack option in case an escort takes up medical resources. This product has a 1.0-thick coating of electrolysis plate and antibacterial powder spray to ensure easy cleaning. Hardware uses stainless steel cushioned hinges that can be opened quickly without harming the user.



Figure 4. Product Design Status Unfold (Picture: Author Self-Portrait)

The first challenge for the use of this product is how to meet the requirements of the hospital environment. The structure must be reliable and compact, and the plates, hinges and structural

elements supporting the single bed can withstand at least 500 kg of pressure, while reducing the space occupied by beds in the ward. The main point of the product is the circular angle design to ensure the use of escorts as safely as possible. This product can save the most ground space, most of the structure in the wall space, with the most efficient attitude for the new day of treatment.



Figure 5. Ward day use (Picture: Author Self-Portrait)



Figure 6. Ward night use (Picture: Author Self-Portrait)

6. Conclusion

After field research and literature review, this paper investigated the problems and tried to solve them by various methods for patients, chaperones, staff needs and behavior. After the analysis of some problems, and some requirements, the design concept was put forward, and based on the design concept, a new experimental form of ward furniture was put forward, some conceptual drawings were drawn, revised and compared, and feasibility study was carried out. The utility model also provides an escort bed, which solves the rest time of the escort.

Because the medical escort furniture is a special kind of furniture design, through the investigation of the interior space and the environment of the ward, we make effective use of the existing space-wall space, which is constrained by the size of the existing space, and find the solution to this problem in the product structure, and apply it to the design practice. One way to save space is to use the folding principle to design an escort bed. Take full account of the use of environmental integrity, simplicity and economy, so that the design can better serve humanity. The design of the product, to some extent relieves the pain of resting in the chaperone's room, has played some positive role.

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